

Citation:

Alexy U, Sichert-Hellert W, Kersting M, Schultze-Pawlitschko V. Pattern of long-term fat intake and BMI during childhood and adolescence--results of the DONALD Study. *Int J Obes Relat Metab Disord*. 2004 Oct; 28(10): 1,203-1,209.

PubMed ID: [15211368](#)

Study Design:

Prospective Cohort Study

Class:

B - [Click here](#) for explanation of classification scheme.

Research Design and Implementation Rating:



POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To evaluate the influence of long-term dietary fat intake on body mass index (BMI) across childhood and adolescence.

Inclusion Criteria:

- Children and adolescents participating in the DONALD (Dortmund Nutritional Anthropometric Longitudinally Designed Study) study who were healthy German newborns and whose mothers and fathers were willing to participate and have at least one parent with sufficient knowledge of the German language
- DONALD participants with at least 10 dietary records between 1985 and 2002, whose dietary data was recorded between the ages of two to 18 years.

Exclusion Criteria:

DONALD participants with fewer than 10 dietary records.

Description of Study Protocol:

Recruitment

Subjects' mothers were recruited in the city of Dortmund, Germany and surrounding communities via pediatric practices and personal contacts.

Design

- The DONALD study is a longitudinal study collecting detailed data on diet, metabolism,

growth and development from healthy subjects between infancy and adulthood

- The study began in 1985 with children and adolescents of different ages participating in anthropometric studies, and has been expanded to include new yearly cohorts of approximately 40 to 50 healthy infants.

Dietary Intake/Dietary Assessment Methodology

- Dietary intake was assessed using three-day weighed food records. Parents of the children or older subjects themselves weighed and recorded all foods and fluids consumed, using electronic food scales, to the nearest gram. Semi-quantitative amounts (numbers or portions) were allowed if weighing was not possible
- Energy and nutrition intakes were calculated using the researcher's nutrient database, LEBTAB, which is continuously updated by all new-recorded food items.

Statistical Analysis

- Nutrient intakes were calculated as individual means of all recorded days and intake of macronutrients was expressed as percent of energy intake to control for age effects
- For all statistical analyses, a significance level of $P < 0.05$ was used
- Cluster analysis was used to classify subjects into groups based on fat intake pattern over childhood and adolescence. A distance matrix was derived using:
 - Similarity of the mean individual fat intake (intra-individual)
 - Similarity of the standard deviations of fat intake (intra-individual)
 - Similarity of individual dietary patterns of fat intake
- The cluster analysis was conducted using a two-stage density linkage to ensure that all points are clustered before the clusters are joined
- To control for age effects, dietary and anthropometric data were transformed into variables independent from age. Energy intake was computed per kg of body weight, per g total food intake, and as a ratio of energy intake to estimated basal metabolic rate. BMI was converted into standard deviation (SD) scores of BMI (BMI-SDS) to allow for calculation of individual BMI in relation to the reference population using the LMS method
- Non-parametric Kruskal-Wallis one-way analysis of variance was used to test for group differences for continuous variables, and chi-square tests were used for between-group differences for categorical variables.

Data Collection Summary:

Timing of Measurements

Measurements (dietary intake and anthropometrics) were taken yearly.

Dependent Variables

BMI (calculated using measured height and weight).

Independent Variables

- Dietary intake of fat was measured using three-day weighed food records
- Energy density (9kJ per g) was measured using three-day weight food records, calculated with beverages included.

Description of Actual Data Sample:

- *Initial N*: 1,039 subjects participated in the DONALD Study
- *Attrition (final N)*: 228 (114 males, 114 females)
- *Age*: Subjects were between the ages of two and 18 years when data was collected
- *Other relevant demographics*: None reported; the authors mention in the discussion that children in the DONALD Study are characterized by higher educational attainment and higher socioeconomic status
- *Location*: Dortmund, Germany.

Summary of Results:

- Cluster analysis revealed four fat intake patterns: Constant, Medium, High, and Low. Constant and Medium had similar fat intake levels, but the SD was higher for the Medium cluster. The High cluster had more than 50% of subjects above the third quartile of fat intake at all ages, and the Low cluster had most subjects below the first quartile for more than half the measurements
- The table below shows energy intake in four clusters of fat intake patterns from 22 subjects; results are given as mean (SD).

Energy and Nutrient Intake	Total	Constant (N=35)	Medium (N=81)	High (N=57)	Low (N=55)	P-value
<u>kJ per kg body weight</u>	229 (39)	235 (35)	227 (42)	236 (38)	220 (38)	NS
<u>Energy density (kJ per g)</u>	3.9 (0.4)	4.1 (0.3)	4.0 (0.4)	4.1 (0.4)	3.7 (0.4)	<0.0001
<u>EI:BMR</u>	1.42 (0.15)	1.46 (0.12)	1.40 (0.14)	1.45 (0.15)	1.39 (0.15)	<0.05
<u>EI:BMR</u>	82 (36)	8 (23)	34 (42)	16 (28)	24 (44)	<0.05
<u>Protein (percent E)</u>	13.0 (1.3)	12.8 (1.1)	12.9 (1.4)	13.4 (1.1)	12.7 (1.2)	<0.05
<u>Fat (percent E)</u>	36.4 (3.2)	37.7 (0.7)	36.0 (1.0)	40.3 (1.4)	32.2 (1.6)	<0.0001
<u>Saturated fat (percent E)</u>	16.1 (1.7)	16.7 (0.7)	15.9 (1.0)	17.8 (1.1)	14.1 (1.2)	<0.0001
<u>Monounsaturated fat (percent E)</u>	15.2 (1.4)	15.7 (0.6)	15.0 (0.7)	16.9 (0.9)	13.4 (0.7)	<0.0001
<u>Polyunsaturated fat (percent E)</u>	5.2 (0.8)	5.4 (0.8)	5.1 (0.7)	5.6 (0.7)	4.7 (0.9)	<0.0001
<u>Carbohydrates (percent E)</u>	50.6 (3.6)	49.5 (1.5)	51.1 (1.8)	46.3 (1.6)	55.1 (2.0)	<0.0001

Added sugars (percent E)	12.5 (3.6)	12.3 (3.3)	12.8 (3.6)	11.2 (2.9)	13.6 (4.1)	<0.05
Cholesterol (mg per mJ)	33.7 (5.9)	34.1 (4.5)	33.2 (5.3)	37.8 (5.9)	30.2 (5.2)	<0.0001
Dietary fiber (mg per mJ)	2.1 (0.4)	2.2 (0.3)	2.1 (0.4)	2.1 (0.4)	2.2 (0.5)	NS

- Mean energy intake (EI) per subject did not differ between clusters
- Energy density was lowest in the Low cluster, and the ratio of EI to BMR was also lowest in the Low cluster
- SDS-BMI did not differ at the first and last examination per subjects, but SDS-BMI during the last study period differed significantly, with the lowest SDS-BMI in the Constant cluster, and the highest SDS-BMI in the Low cluster.

Other Findings

- No differences between clusters concerning subject characteristics were found (number of records per subjects, number of missing records per subject, number of days per subjects, sex, age and education level of subjects and their mothers)
- There were significant differences of mean intake of food groups between clusters. Meat, fish and eggs and fat and oils intake were highest for the Constant and High clusters; fruit and vegetable intake was highest in the Low and Medium clusters
- Mean intakes for all macronutrients differed between the clusters, with the exception of dietary fiber.

Author Conclusion:

The authors concluded that these analyses showed that the etiology of obesity could most probably not be explained by different dietary patterns related to fat intake during childhood and adolescence.

Reviewer Comments:

Energy density calculations in this study included beverages.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

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|----|---|---|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | <div style="background-color: #92d050; padding: 5px 10px; border: 1px solid black;">Yes</div> |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about? | <div style="background-color: #92d050; padding: 5px 10px; border: 1px solid black;">Yes</div> |

3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	Was the research question clearly stated?	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	Was the selection of study subjects/patients free from bias?	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	No
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	Were study groups comparable?	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A

3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	Was method of handling withdrawals described?	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	Was blinding used to prevent introduction of bias?	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A

6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	Were outcomes clearly defined and the measurements valid and reliable?	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	???
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	N/A
8.	Was the statistical analysis appropriate for the study design and type of outcome indicators?	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	No
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	Are conclusions supported by results with biases and limitations taken into consideration?	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	Is bias due to study's funding or sponsorship unlikely?	Yes

10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes